

April 20, 1871.

Dr. WILLIAM HUGGINS, Vice-President, in the Chair.

The following communications were read :—

- I. "Note on the circumstances of the Transits of Venus over the Sun's Disk in the years 2004 and 2012." By J. R. HIND, F.R.S. Received March 1, 1871.

While preparations are being made by astronomers of various nations for the observation of the approaching transit of Venus over the sun's disk in December 1874, it may be of interest to know under what conditions the pair of transits in the twenty-first century will take place. This consideration has induced me to make a careful calculation of the circumstances of the transits in 2004 and 2012, from M. Leverrier's Tables of the Sun and Planet, which at present are extremely accurate, and which, there can be little doubt, will closely represent the phenomena to be witnessed in those years. The calculations have been made entirely by myself, but with every precaution to avoid error, and I have confidence in the results.

The following are the resulting elements of the transit in 2004 :—

Greenwich mean time of conjunction in right ascension 2004, June 7^d 20^h 51^m 28^s.8.

| | |
|--------------------------------------------------------------------------------|---------------|
| Right ascension of Sun and Venus | 76° 50' 28".6 |
| Declination of Sun | +22 53 20.4 |
| " Venus .. | +22 42 52.3 |
| Horary motion in R.A. Sun | 2 35.07 |
| " " Venus .. | —1 37.40 |
| Horary motion in declination. Sun | +0 13.00 |
| " " Venus .. | —0 43.83 |
| Semidiameter of Sun | 15 45.74 |
| " Venus .. | 28.75 |
| Horizontal parallax Sun | 8.78 |
| " " Venus .. | 30.85 |
| Log. distance of Venus from the Earth.. | 9.46069 |
| Equation of time .. 1 ^m 15 ^s .6 (additive to mean time). | |

Hence, for the centre of the earth,—

| | d | h | m | s | | |
|-----------------------------------|--------|----|----|----|------------------------------|-------------------------------|
| First external contact ... | June 7 | 17 | 3 | 43 | at 115°.0 from N. towards E. | |
| " internal " " | | 17 | 22 | 35 | at 118.0 " | } For the direct image. |
| Second internal " " | | 23 | 5 | 40 | at 214.6 " | |
| " external " " | | 23 | 24 | 32 | at 217.5 " | |

And l being the geocentric latitude, ρ the radius of the earth at any place,

At Greenwich the egress only will be visible.

| | | | | | | | |
|------------------------|---------|----|----|--------------|--------------|-----------------|------------|
| | | | | | | | |
| | | | | ^h | ^m | ^s | |
| Last internal contact, | June 5, | at | 16 | 44 | 23 | } Mean times at | Greenwich. |
| „ external | „ | „ | 17 | 2 | 15 | | |

The sun will rise at 15^h 46^m.

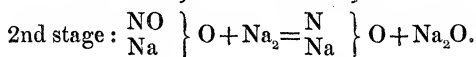
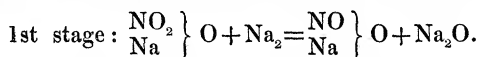
II. "On the Existence and Formation of Salts of Nitrous Oxide."

By EDWARD DIVERS, M.D. Communicated by Professor W. ODLING, M.B., F.R.S. Received March 2, 1871.

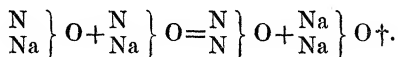
1. Metallic sodium thrown on a solution of an alkali nitrate was found by Schönbein* to reduce it to nitrite. He contented himself, however, with merely detecting the nitrite by the iodide and starch test. By using the sodium in the form of amalgam the complete reduction of the nitrate to nitrite can be readily effected, and silver nitrite freely precipitated from the solution by first neutralizing it with an acid and then adding silver nitrate.

2. But so soon as nitrite is thus formed by the sodium, it itself begins to suffer reduction, as well as the remaining nitrate, by the action of more sodium. This reduction of the nitrite is rendered evident by the effervescence which attends it, the gas given off consisting of pure nitrous oxide. If excess of sodium amalgam be gradually added to the nitrate solution, and its action moderated by keeping the vessel containing the mixture in a stream of cold water, the effervescence only becomes very lively when the sodium added has nearly reached the proportion of two atoms to one of the nitrate used. When four atoms of sodium have been oxidized by the solution, the further addition of it is without effect; no more effervescence takes place, and the sodium remains unchanged in the mercury.

3. The very alkaline liquid which is left by the reaction contains a new salt, though in relatively small quantity—the salt of nitrous oxide. The action of sodium on sodium nitrate may therefore be thus formulated:—



As regards the escape of nitrous oxide during the reduction, this is explained by the reaction on each other of two molecules of the new salt, under the influence of the heat produced by the oxidation of the sodium, thus:—



* Erdmann's Journ. für prakt. Chemie, vol. lxxxiv. (1861) p. 202.

† When ammonium nitrate is employed instead of sodium or potassium nitrate, the action of the sodium is the same; and it is here interesting to point out that ammonium nitrate is an exception to the conclusion at which Gay-Lussac and Thénard arrived (Journ. de Physique, vol. lxix. 1809, p. 463), after they had tried the carbonate, chlo-